

## **CHAPTER-II**

### **A BRIEF REVIEW OF LITERATURE**

#### **I. INTRODUCTION**

Economy of West Bengal is primarily dependent on agriculture and on medium size industry. Although, recently service sector and heavy industry is playing vital role but it is not sufficient to bring better life for the people of West Bengal. Agriculture in the State of West Bengal is the major source of occupation of the rural people. It accounts largest share of the labour force and it contributed around 18.7 per cent to the state's gross domestic product (2009-10). West Bengal is the largest producer of the rice and second largest producer of potatoes in India. Other major crops produced in the state are maize, pulses, oil seed, wheat, barley vegetables etc. in large extent. But the position of farm sector in West Bengal is not good from the side of landholding, skilled labour, farmmechanization, availability of credit, marketing, storage facilities and from other necessary requirements which lead the farm sector lucrative. It is small farmer centric with 90 per cent of the cultivators being small and marginal farmers. Small and marginal farming communities hold 84% of the state's agricultural lands. In addition to that about 30 lakh landless families have earned the right to cultivate and grow crops on their own land after enactment of Operation Barga system. West Bengal is the highest population density state (976 per sq. km) in the country. As a result, the per capita cultivable land holding is under the process of land fragmentation. This has resulted in uneconomic holding size to sustain a farmer's family. Increase in the price of agricultural inputs, fragmentation of land holding, uncertain prices of perishable agricultural produces, inadequate market infrastructure, distress sale of produce by small and marginal farmers etc. are some of the problems being confronted by the farmers of the state. Similarly, due to lack of proper marketing and processing facilities and for high price of feeds and fodder for farm animal, management of the traditional farming system in the rural areas has become more difficult than ever before. On the other hand, farmers are not much educated so they can't enjoy the scientific methods of farming. Similarly farmers not getting adequate amount of credit by which they can use needful

fertilizers, pesticides advanced machineries. One another big problems of farming of this state is use of off mode farming tools. Farmers are not using advanced machineries because of absence of proper knowledge, fragmented land holdings, lack of credits etc. That is why cost of cultivation gradually increasing which leads unsatisfactory cultivation in the state. By and large, the socio-economic conditions of the farming community is gradually declining calling for time bound adoption of appropriate technical, social, financial and market interventions for ensuring sustainability. There have been a number of attempts to examine whether the expansion of farm mechanization is attainable or not in West Bengal. Different researchers have studied from different angles on mechanization. Some of them studied impact of mechanization on productivity, someone on employment and number of researchers studied impact of mechanization on crop diversification and on production. Similarly, few researcher attempts to discuss the impact of farm mechanization on labour employment and on cropping intensity. We have discussed the review of literature as follows:

## **II. THEMATIC GROUPING**

### **II.1. Impact of Farm Mechanization on Agricultural Production and Productivity**

One study has made by Sanjeev Goyle (December, 2013) there he showed that sustain increase of agricultural mechanization ensure greater return and timely operation. He told that farm productivity in India is far less than USA, Brazil, China, and other developed countries. But population growth is very high in India. So to provide sufficient food grains for the nation's people farm mechanization is only remedy of this problem.

C.R Meheta (2013) has conducted one another study and he stated that there is a positive correlation between farm productivity and farm power availability. He told that as farm power (kw/ha) is increase farm productivity (t/ha) also increase simultaneously. With the sufficient farm power share of draught animal and manual worker has come down from 60.5% in 1971-1972 to 13.2% in 2010-2011.

According to Singh and Singh mechanized farming gives higher productivity and production. They had made one study in 1972 where they concluded that tractor farms give

high yields of wheat, paddy and sugarcane. Overall production per hectare in mechanized farming is higher than non-mechanized farming.

National Council of Applied Economic Research (NCAER) conducted one study in 1973 to see the impact of farm mechanization on farm productivity and production. This study compared the values of annual farm output per hectare of net sown area under different level of mechanization. It has found that the output per hectare was found to increase as the level of mechanization increased from irrigated non-mechanized farm to tube well, tractor-thresher farms.

Institute for Techno-Economic Studies, Madras in 1975 made one study on farm mechanization. This study want show the productivity difference between tractor-owned mechanized farming and hiring farm mechanized farming. It has found that productivity paddy, sugarcane, and groundnut on tractor- owned farming increased by 4.1 per cent to 28.3 per cent, 13.1 per cent to 34.2 per cent and 9.8 per cent to 54.8 per cent with the average value of 15.8 per cent, 23.2 per cent and 31.8 per cent respectively. On the other hand the average increase productivity on farm hiring tractors was reported to be 11.8 per cent, 13.0 per cent and 16.0 per cent for paddy, sugarcane and groundnut respectively.

On another study has conducted by the Pathak et al. in 1978 surveying five different categories of farms in Ludhiana district on Punjab to asses of the effect of power sources on production and productivity. They found that the yield of paddy, maize and wheat was reported to higher on tractor farms than on bullock farms. They said that the use of tractor enhanced farm productivity due to better seed-bed preparation, timeliness of operations. This mechanized farming also helps to proper use of the seed-cum-fertilizer drills.

Again in 1980 National Council of Applied Economic Research (NCAER) conducted a survey on farm owing tractors, using tractors on custom-hire and owning bullocks in seven states belongs to three agro-climatic zones. In this study total 815 households was selected randomly from 85 villages. After surveying it was reported that an average tractor owing farm obtained higher yields than a custom hiring and bullock farm.

Aggarwal in 1983 prepared a study collecting 240 sample from Punjab to analyzed wheat cultivation on mechanized farming. The study revealed that the use of tractors instead of bullocks for ploughing and sowing did not add to the yield of high yielding varieties of

wheat. It appeared that the advantage of timeliness operation of tractor was nominal, when the crop preceding to wheat could be harvested and threshing sufficiently in advance and land could release for timely wheat ploughing and sowing even on bullock farms. Author said that unlike the neutral use of tractor, the use of tube wells in comparison to canals was found to have significant positive effect on the productivity.

A study has propounded by Nandal and Rai in 1986 dividing Haryana in three homogeneous zones on the basis of intensity of mechanization. Total 54 farms were selected from each of the three zones making a total sample of 162 farming households. The result has appeared that the tractor operated farms had higher yield on wheat and paddy. They also found that in case of custom hiring of tractor farms the yield was comparatively low.

A combined study has made by Balishter, Gupta and Singh in 1991 collected data from Mathura district of Uttar Pradesh on the basis of three levels of mechanization. They has classified the level of mechanization as (i) non-mechanized farm having neither tube-well nor tractor, (ii) Partially mechanized farm having tube-well and (iii) mechanized farm having both tube-well and tractor. They found the yield was reported to be higher by about 10 to 27 per cent in merchandised farms and by about 2 to 26 per cent in partially merchandised farms in comparison with low mechanized farms for all types of major crop.

One unique study has framed by Laxminarayan et.al. in 1981 to show the use of machineries on harvesting and threshing activities of farming. They showed that although machineries used in the purpose of harvesting and threshing save time and reduce cost but this technique wastage the food grains. They reported that more or less 6 per cent grains loss due to use of harvester and thresher where in traditional technique loss food grains only 2-4 per cent.

Singh and Chandra have propounded a very important study regarding use farm machineries on farm sector in 1991. They used linear regression function to examine the effect of important inputs on crop productivity for the state of Punjab. Inputs which are considered in this study are farm power, fertilizer and irrigation. This standardized regression coefficients were calculated for relative efficiency of different inputs. They found that relative efficiency of farm power was higher followed by fertilizer and irrigation.

A valuable study regarding impact of farm mechanization on farm productivity has conducted by Rao in 1978. He has investigated the effect of the tractor use on productivity using methodology on recall basis i.e. data obtained before and after tractor acquisition on land. He has conducted near about 4000 tractor owning farmers through a mailed questionnaire but only 1500 farmers has answered. Based on these available responses Roa has concluded that tractor owning farmers obtained higher yields per acre compared to bullock farming.

One study has conducted by Nandi and Rai in 1986 in Haryana. They have divided Haryana in to three homogeneous zones on the basis of intensity of mechanization. They have collected 54 farmers from each zones making total sample 162. The study has showed that tractor operated farms obtained higher productivity to produce wheat and paddy. They also suggested that some farmers are using tractors on custom hiring basis but the productivity is not same with tractor owned farmers because farmer who has own tractor they can use it in batter way as required.

## **II.2. Impact of Farm Mechanization on Employment of Human Labour**

The study propounded by D.A Mada and Sunday Mahai (October, 2013) has showed the peoples are not interested in farm activities rather they are very much comfortable with non-farm jobs.so they migrated from farm sector to non-farm sector. As a result farm size and farm rural wage have been increased. These were the driving force of agriculture mechanization industry. It had made off -farm employment opportunity and improves socio economic status of rural farmers through the farm mechanization. To sustain income status of small scale farmers and welfare of rural farming communities, the manual power is gradually replaced by single axle multipurpose machines from land preparation to post-harvest. They should be plan for joint utilization system of agricultural machinery, to improve quality and quantity production of agricultural products.

One study has conducted by Billing and Singh in 1969-70 to know the impact of farm mechanization on labour employment. They showed that aggregate impact of adopting the improved technologies in Punjab results in reduction of human labour employment was 11.5 per cent compared to traditional technique. Similarly they showed that farm mechanization did spread out much in Maharashtra and labour employment also reduced slightly by 0.2 per cent.

Two separate studies have been made by Bhagabati committee and Johl in 1970 to investigate the labour employment along with farm mechanization. Both of these studies told that farm mechanization displaced only bullock labour and employment of human labour increased due to increasing cropping intensity. They argued that use of improved farm mechanization enlarges the scope of multi cropping and cropping intensity and as a result employment opportunity increased.

Agro-Economic Research Centre (AREC) has propounded a valuable study on labour employment in farm sector in 1970-71. Total 96 samples have been surveyed in Haryana to construct the study. This institute has concluded that use of tractor displaced only pair of bullock rather than human labour. It has reported that the overall human labour input for crop production per cultivated hectare was particularly the same for both types of farms.

One another study has been conducted by Babu in 1971 in West Godavari district of Andhra Pradesh. According to him tractor and other improved implements enhanced the farm productivity and production. This higher productivity enhanced the labour requirement in farm sector. That is why demand of farm labour increased to produce more farm output.

Grewal has conducted one study regarding the labour employment in 1972 to give comparison between bullock operated farm and mechanized farm. He said that the employment of bullock labour on mechanized farms was 85 per cent less than which only used only bullock labour for farm operations. On the other hand the average reduction in labour input on mechanized farms was only 11.9 per cent in comparison to non-mechanized farms. He also argued that mechanized farm gives higher productivity compared to non-mechanized farms.

A combined study has been done by Babu, Grewal and Harrington to examine the impact of mechanization on employment. According to Babu (1971) conducted a study in West Godavari district of Andhra Pradesh and reported that tractor use induced changes in cropping pattern which promoted the demand for human labour. On the other hand Grewal (1972) reported that the employment of bullock labour on mechanized farms was 85 per cent less than those, which used only bullock labour for farm operations. The average reduction in labour input on mechanized farms was 11.9 per cent in comparison to non-mechanized farms. The average output per man-days on tractor-operated farms was about 42 per cent higher than on bullock operated farms. According to Harrington (1972) restraint

on the rate of agricultural mechanization was necessary to solve the problem of under-employment in India. In his opinion, more labour would be employed for land preparation, water management, weed control, insect and disease control, harvesting and threshing when higher yields were obtained by adopting HYV technology.

National Council for Applied Economic Research (NCAER) has made one study in 1973 collecting data from Muzaffarnagar district of Uttar Pradesh. It was found that labour input per hectare increased from non-mechanized farm to mechanize with proper irrigation facilities farming. It has reported in this study that when both use of improved implements and proper irrigation works together farm employment increased rapidly.

Aggarwal in 1983 made another study to identify the impact of mechanization on farm employment. He concluded that tractors replaced mainly family labour time on small farms and permanent labour time on large farms. Similarly he showed that use of thresher displaced mainly family and casual labours time on small farms and family and permanent labour time on large farms.

Sidhu and Grewal conducted a study in 1991 regarding the labour employment on farm sector taking data from Punjab. They showed impact of combine machinery use say, tractor and combine harvester on farm labour. The present study revealed that tractorization did not replace human labour. There was no significant difference in human labour use on tractor operated farms and bullock operated farms. They said the introduction of combine harvester significantly reduced the use of human labour on farms.

Again NCAER (National Council of Applied Economic Research) in 1980 studied the implications of tractorisation on employment adopting a cross-section comparison of tractorised households with operated farms. This study said that in conventional practice, the bullocks provided the motive power and implements were guided by human labour. Although from this study it may be said that certain amount of human labour displacement was inevitable in the operations where a tractor was employed, tractorised farms produced more output on a hectare of land by following more scientific agronomic practice and applying optimal doses of material inputs and thereby provided employment more labour. Side by side in this it has said tractorised farm also raised commercial crops on a relatively larger area and as a result changes of cropping pattern had a favorable impact on the total employment.

One another study has taken in 1977 propounded by Singh and Goswami reported a comparative study of tractorised and bullock operated farm in Purnea district of Bihar in which they argued the human labour days employed on an average cropped hectare on tractorised farm worked out to 87.6 man days with 113.9 man days on custom- hiring farms and 120.6 man days on bullock operated farms. They observed that the percentage share of labour requirement for intercultural, irrigation, harvesting and threshing operation was higher in case of tractorised farms as compared to bullock operated farms

This paper attempts to infer written by Martin H Billings and Arjan Singh, the influence of technological changes in farm production methods on employment and income distribution among cultivators and agricultural labourers from a physical projection model. They said that although a less-than-perfect vehicle for such analysis, the model can provide insight into the pattern of labour displacement, its possible rate and the composition of displaced farm workers. According to them an attempt will be made to associate the composition of rural labour force with (1) specific production activities; and (2) farm sizes, such that we can't have some grounds for associating the effects of technical changes upon employment per work group. Also they mentioned an examination will be made of the implications of alternative modes of tractor ownership upon custom operations for non-owners regarding both employment and the ability of the latter to share in new income opportunities.

### **II.3. Impact of Farm Mechanization on Cropping Intensity**

To know the impact farm machineries on cropping intensity Chopra has made one study in 1974. He has prepared his study based on the farming of Punjab state in India. He wants to compare the cropping intensity between tractories farming and non-tractories farming. He found that cropping intensity is far better in tractor use farming than non-tractor use farming. It has reported that cropping intensity was higher after introduction of tractor.

National Council of Applied Economic Research (NCAER) conducted a study on tractorised and non-tractorised farming in nine states in India in 1974. This study revealed that tractor owning farms had a higher cropping intensity with 137.5 per cent as compared to 131.8 per cent in the case of those without a tractor. It has also found that cropping intensity is higher in small farming. In this study author has showed that among all surveyed states cropping intensity is higher in Punjab followed by Uttar Pradesh, Tamil Nadu and lowest in Rajasthan and Maharashtra.



Pathak et al. has made one study on a sample of 115 farms in Ludhiana district in 1974 to show the cropping intensity between tractorised farming and bullock farming. They have found that cropping intensity with fodder crop was higher in bullock farming than tractorised farming. But in case of without fodder cropping intensity is higher in tractorised farming compared to bullock farming. However medium size of farming having 7-12 hectare landholding cropping intensity for with fodder crops is higher in tractor farming than bullock farming.

Again another study has made by National Council for Applied Economic Research (NCAER) in 1980 to show the impact of tractor use on cropping intensity. This study has framed on the basis of seven states in India belongs to three major agro-climatic zones. It has found that cropping intensity for tractor owning and tractor using household in all the states was higher than that of bullock farms. In this study also expressed that cropping intensity is higher for small farming than large farming.

Aggarwal in 1983 said that the use of tractor and tube wells gives higher cropping intensity compared to use of bullock and canals irrigation farming. In this study it has showed that cropping intensity is higher in case of tractor owned farming compared to use of tractor in hiring system. Cropping intensity is positively related with better irrigation small size farming.

One important study has made by Nandal and Rai in 1986 in Haryana state on a sample of 154 farmers from each of the three zones makes a total sample of 162 farming households. The study concluded that the cropping intensity showed consistently positive relationship with tractorization. Same result has found in this study also that is cropping intensity is much higher in tractorised farming compared to animal oriented farming.

Another important study has made by the Patil and Sirohi in 1987 to measure the impact of tractorization on irrigated farms of Ahmednagar district of Maharashtra state. The study has analysed the difference in cropping intensities of different farm size groups of four categories. This study showed that cropping intensity of small farming denoted by TOF (Tractor Operated Farming) and TOF+BOF (Bullock Operated Farming) was significantly higher compared to BOF+ THF (Tractor Higher Farm) farming system.

Balishter et al. in 1991 conducted a study based on data of Mathura district of Maharashtra. The concluded that the average cropping intensity was the highest in mechanized farms having tube well and tractorised farming followed by partially mechanized farming having only tube well and non-mechanized farming. The cropping intensities for the above farming system are 206.4 per cent, 176.6 per cent and 143.8 per cent.

It was Singh who made one study to investigate the impact of different factors like irrigation, fertilizer, cropping on cropping intensity in different states of India in 2001. Singh argued that, cropping intensity was mainly dependent on annual water availability. He said rainfall distribution in a year as well as percent area irrigated in different seasons reflected the water availability. It has found that annual rainfall in Punjab is low having 555 mm but with this available rainfall this used it properly and cover total 94 per cent irrigated area. As a result total cropping intensity achieved at 180. But for Assam annual rainfall extreme high with 1449 mm though this huge rainfall did not use properly and only cove 27.90 per cent irrigated area. As a result cropping intensity became only 142. Author said that farm power effectively used with sufficient water supply.

According to Anwar Alam agricultural mechanization refers to interjection of improved tools, implements and machines between farm workers and materials handled by them. In this study pump sets, power threshers, tractors, power tillers and matching implements, including for 65Million draft animals have become popular. Also he found that seed and seed-cum-fertilizer drills, planters, mechanical rice transplanters, vertical conveyor reapers, and combines soon followed and in the recent past, Zero-till Drill and Raise Bed Planters have found good acceptance from the farmers. The author realized that currently mechanization is in increasing demand and farmers, policy makers and developmental agencies now realize that for increasing production and productivity at reduced unit cost of production, free of arduous labour, agricultural mechanization is essential. He showed that for achieving desired intensity of cropping average farm power requirement of 2 kW/ha is considered essential, currently it is 1.15kW/ha. At the end author said shifts in agriculture leading to crop diversification towards horticulture, animal husbandry fishery, forestry and on-farm agro-processing are going to bring in greater degree of mechanization.

### **III. RESEARCH GAP**

Throughout the journey of literature review in our study we found the number of literature conducted on the relation of farm mechanization and farm productivity, farm mechanization and labour employment and farm mechanization and cropping intensity and crop diversification. Most of literatures are covered the agricultural scenario of states of India except West Bengal. For evidence we can say, Balishter, Gupta and Singh conducted a study in 1991 for the state of Utter Pradesh to show the relation farm productivity and farm mechanization, Nandal and Rai also has conducted a another study in 1986 for the state of Haryana to show the same relation. Similarly, Sidhu and Grewal conducted a study in 1991 regarding labour employment and farm mechanization for the state of Punjab. Although few studies we found in relation to farm mechanization and farm productivity conducted in West Bengal, we did not find any study related to farm mechanization and landholding, farmer's education and farm credits. Although few small study has conducted on the issue of farm mechanization these are not sufficient to guide the agricultural scenario of West Bengal.

### **IV. CONSOLIDATION OF RESEARCH IDEAS**

Throughout the reviewed literatures we found that there is positive correlation between farm mechanization and farm productivity. Numbers literatures showed that farm production and productivity should increase in such a way that increasing people in the country gets their required foods. But this requirement would be fulfill if farmer gets required farm power per hectare for their cultivation. On the other, hand if we relate farm mechanization and use of farm labourer, different controversy emerged. Numbers of studies told that mechanization shrink the use of manual farm labour. But few of them told that mechanization only replace the drought animal. They argued that farm mechanization helps timely operation in farm sector which rapid up the use of farm labour. Advanced farm mechanization also helps cropping intensity. Researchers told that tractorised farm gives higher cropping intensity than non- tractorised farm. Few studies also highlighted the impact of farm mechanization on crop diversification. We found here mechanized farming utilize other farm input like fertilizer, pesticides, water etc. commendably. So farmers move from the traditional crop farming to modern commercial crop farming.

The major problem which we faced on this study is most of the literatures are very old. These all more or less conducted before 1980s. But the present farm technique, food requirements, land holdings, job availability of farmers is quite different from previous days. There is not sufficient numbers of literatures which are conducted after new economic policy (1990) with which we can relate our study. Another significant problem of our study is that most of the studies states that mechanization means tratorisations. Huge part of farm mechanization is covered by tractorisation. They did not much emphasize on the implementation of others farm machineries like, harvester, threshers, sprayers, dryers, pump sets etc. Mechanization is compatible with credits availability because price of big machineries is very high which is not affordable to the small poor farmers. So credits provided by government with lower cost are only remedy to use these farm machineries. But there is not sufficient numbers of studies related to availability of credits and use of farm machineries in our study which is another problem of our study.

## **V. FUTURE RESERCH NOTES**

Research on agricultural mechanization is vast area of research. Mechanization depends on several factors. It is not possible to solve the problem of mechanization effortlessly for the developing and under developed nations where share of nations GDP depends on farm sector heavily. The above two categories nations are suffering from lack of credit, education, economic land holding which are the major factors of successful farm mechanization. To draw the accurate measure of farm mechanization researchers should examine above all the factors one by one. On the other hand farm mechanization deals with different type's farm machineries. So researchers should focus on all types of farm machineries whether are implemented successfully or not. One another thought of research may develop that mechanization more or less replace man workers rather than women workers engaged in farm sector.